Stormwater Management

Environmental Concerns

Stormwater runoff is precipitation that has not been absorbed by the ground. Rather, it washes over the surface of the land picking up pollutants as it travels. Stormwater runoff may collect soil particles, petroleum products, residues from industrial activities, litter, and pet waste. All of these pollutants are carried with the runoff into surface waters where they adversely impact water quality.

The volume of stormwater runoff increases as natural forests and fields are replaced with hard surfaces such as buildings, parking lots, driveways, and roads. Also, without any plants to disrupt the flow, stormwater moves across the land more quickly than it did under predevelopment conditions. This greater, faster flow of stormwater can severely degrade receiving water bodies by accelerating erosion which leads to flooding, destruction of plant and animal life, and loss of habitat. Also, pollutants carried by stormwater impair water quality by increasing levels of nitrogen, phosphorous, suspended solids, biological oxygen demand, and chemical oxygen demand. Temperatures and levels of toxic metals and hydrocarbons tend to increase, dissolved oxygen decreases, and the acidity-alkalinity of the water typically changes. The result is that near shore areas are less able to support wildlife like young fish and crabs. Also, using the water for human recreation becomes less desirable.

Legal Setting

General Permit for Discharges from Marinas

All marinas or other facilities that conduct boat repair, painting, or maintenance (including pressure washing) are required to obtain a General Permit for Discharges from Marinas from the Maryland Department of the Environment (MDE). The permit covers stormwater and nonstorm wastewater discharges from:

- areas involved in boat maintenance (rehabilitation, mechanical repairs, painting, and fueling) and cleaning operations,
- wastewater discharges to surface or groundwater from boat and equipment washing areas,
- noncontact cooling water and condensate discharges to surface waters from ice machines, refrigeration units, and other machinery, and
- bilge water treatment systems.

The control of pollutants that may be carried by stormwater runoff from vessel maintenance areas is addressed in *Vessel Maintenance*. Please refer to *Laws and Regulations* for more information about the General Permit for Discharges from Marinas.

State Law: Sediment Control and Stormwater Management

Maryland Environment Article Title 4 Subtitles 1 and 2 require that any construction project that disturbs 5,000 square feet or more of land or results in 100 cubic yards or more of earth movement must have approved erosion, sediment, and stormwater management plans before construction begins. The plans are typically approved by the local Soil Conservation District. For construction projects that disturb five or more acres, you must also obtain coverage under the NPDES General Permit for Construction Activities.

Critical Area Program

Critical Area criteria require that the impacts of any development or redevelopment within the Critical Area be reduced by adopting measures to control stormwater runoff. The extent of the required management measures differ depending upon whether you are sited within a Limited Development Area (LDA) or an Intensely Developed Area (IDA). Any new development in Limited Development Areas must limit impervious area to 15 percent of the project site. Stormwater facilities must be designed to eliminate all runoff caused by the development in excess of that which would have come from the site if it were in its pre-development state. For Intensely Developed Areas, the criteria specify that management measures must reduce post-development pollutant loading to a level that is 10 percent below the load generated at the same site prior to development. This requirement is commonly referred to as the "10 Percent Rule." Contact your local Critical Area representative (see *Appendix II*) for guidance on complying with the 10 Percent Rule. Refer to *Laws and Regulations* for a fuller discussion of Critical Area criteria.

Best Management Practices to Control Stormwater Runoff

Practice Low Impact Development. The goal of low impact development is to develop a site without altering the existing hydrologic cycle. The approach takes advantage of a site's natural features – including vegetation – to minimize the need to build expensive stormwater control devices. It is counter to traditional stormwater management which uses structures like curbs, gutters, and storm drains to move water off-site as efficiently as possible. Traditional structures cause unnatural volumes of runoff to move into receiving waters at high velocity.

❖ Capture and treat stormwater on site.

✧ For example, direct the runoff from your parking lot to a bioretention area rather than toward a storm sewer pipe. A "rain garden" is an example of a bioretention area. It is an area planted with native vegetation and sited such that it collects stormwater. Water, nutrients, and pollutants are taken up by soil and plants within 24 to 48 hours after a storm. Rain gardens have the added advantage of being attractive areas that can provide shade and wildlife habitat, act as wind breaks, and muffle noise.

✧ Contact Prince George's County Department of Environmental Resources for additional information about low impact development and rain gardens.

Cultivate Vegetated Areas. Healthy soil and vegetation capture, treat, and slowly release stormwater. The water is cleaned through a combination of microbial action in the soil, vegetative uptake, evaporation, and transpiration.

❖ Plant environmentally-sensitive landscapes at the edge of parking lots and within islands in parking lots. Refer to *Appendix III* for information about the BayScapes Program.

❖ Plant vegetated buffers between your upland property and the water's edge.

❖ Position downspouts so that they drain to vegetated areas – avoid draining to concrete or asphalt.

✧ Construct wetlands to remove pollutants, protect the shore from storms, and provide habitat for aquatic species and birds.

✧ Use grassed swales to direct stormwater on your property. Grassed swales are low gradient conveyance channels planted with erosion-resistant vegetation. They improve water quality by filtering out particulates, taking up nutrients, and promoting infiltration. Also, water generally moves more slowly over a grassed swale than it would in a pipe. Grassed swales are not practical on very flat land, on steep slopes, or in wet or poorly drained soils.

Minimize the Amount of Impervious Area. The less impervious area on site, the less runoff you will have to manage.

❖ Pave only those areas that are absolutely necessary.

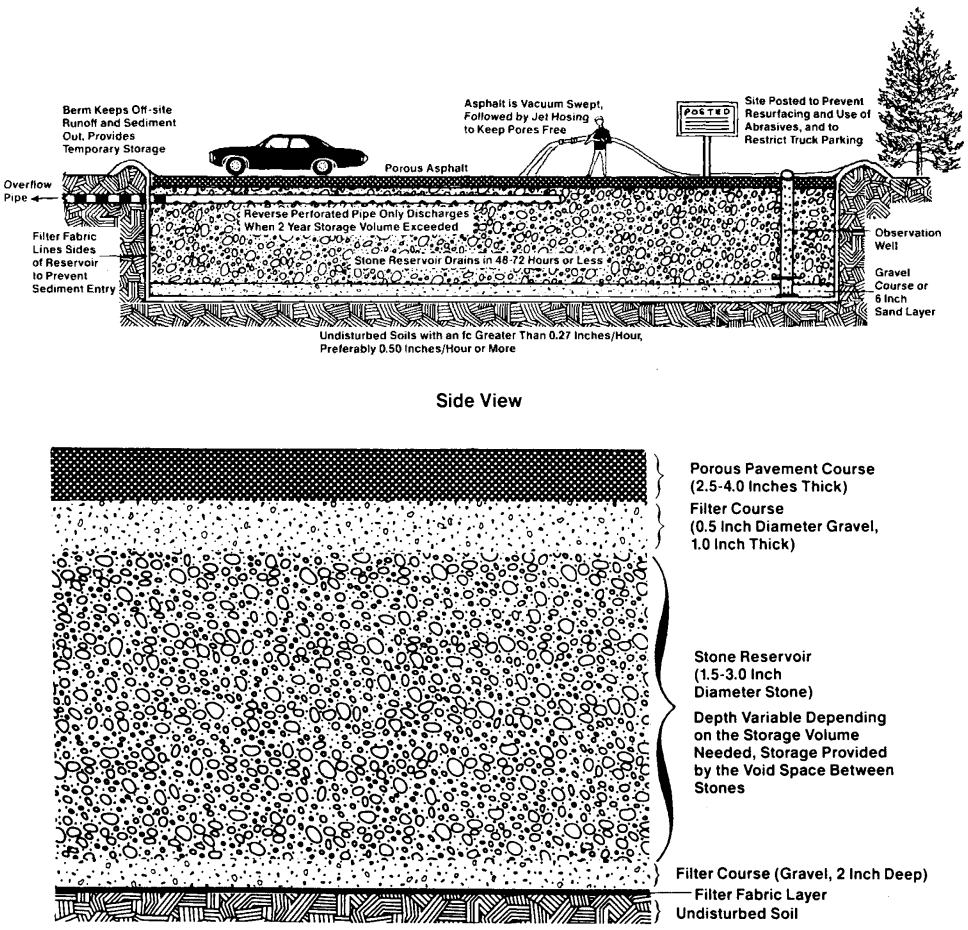
❖ Minimize the length of new roadway required to serve new or expanding marinas.

❖ Plan roads so they do not cross sensitive areas such as tidal wetlands.

❖ Consider alternatives to asphalt for parking lots and vessel storage areas, *e.g.,* dirt, gravel, seashells, engineered porous pavement. See *Figure 1* for a depiction of porous pavement.

✧ Investigate a non-toxic, organic soil binder derived from the *Plantago* plant family. When this binder is combined with crushed aggregate (*e.g.,* gravel, shells) and soil, it creates a somewhat permeable surface that will not erode. For less than or equal to the cost of asphalt, it is a resilient material that will not crack during winter freeze/thaw cycles, can be repaired by adding more material and tilling the surface, and can be dug up with a shovel to plant trees and shrubs.

Figure 1. Porous Pavement



Source: Schueler, T.R. 1987. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban Best Management Practices.* Washington, DC: Metropolitan Washington Council of Governments.

Use Structural Controls as Necessary. Because of space limitations or other constraints, it may be necessary to adopt more traditional practices such as pond systems, wetland systems, infiltration systems, and filter systems.

- Stormwater pond systems capture and slowly release storm flows. Ponds may be permanent (retention ponds) or may hold water only temporarily (detention ponds). A Dry Extended Detention pond is an example of a stormwater pond system (see *Figure 2*). Dry Extended Detention Ponds hold runoff for up to 24 hours after a storm. Water is slowly released through a fixed opening. The pond is normally dry between storms. This type of structure is effective for sites that are 10 acres or greater in size.
- Stormwater wetland systems are designed to mimic the ability of natural wetlands to cleanse and absorb storm flows. A Pocket Wetland (see

Figure 3) is created by excavating to the high water table elevation. Pocket wetlands can serve drainage areas of 5 to 10 acres.

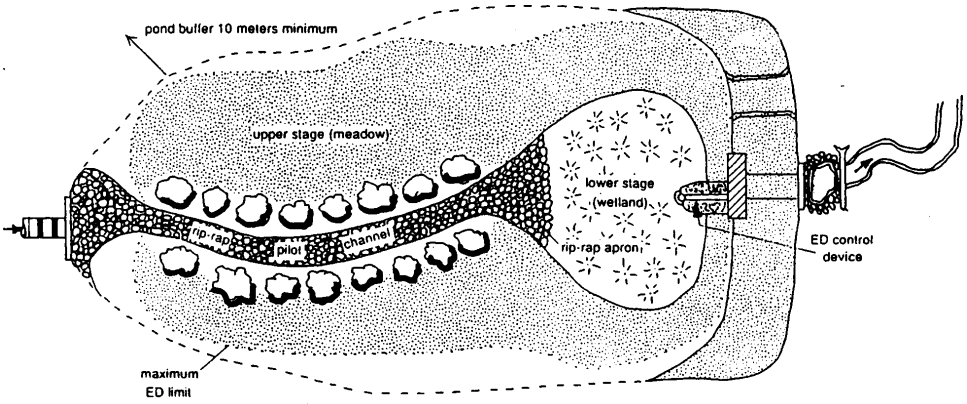
- Infiltration systems are designed to take advantage of soil's natural infiltration capacities and pollutant removal characteristics. A Dry Well (see *Figure 4*) is an infiltration system designed to treat roof top runoff. Water is collected in downspouts and directed into a filter composed of crushed stone and fabric. Rain gardens and porous pavement are other examples of infiltration systems.
- Filter systems "strain" runoff to remove pollutants. Conventional Sand Filter Systems (see *Figure 5*) are constructed of layers of sand, from most course on top to most fine below. The sand overlies either a gravel bed (for infiltration) or perforated underdrains (for discharge of treated water). Oil Grit Separators (see *Figure 6*) are another form of filter system. Water from parking lots and other areas likely to have hydrocarbons should be directed through Oil Grit Separators (or oil absorbent fabric) before entering any other management structure.

❖ ALL stormwater management structures must be maintained in order to be effective.

✧ Refer to *Table 1* for assistance selecting a structure that is appropriate for your property.

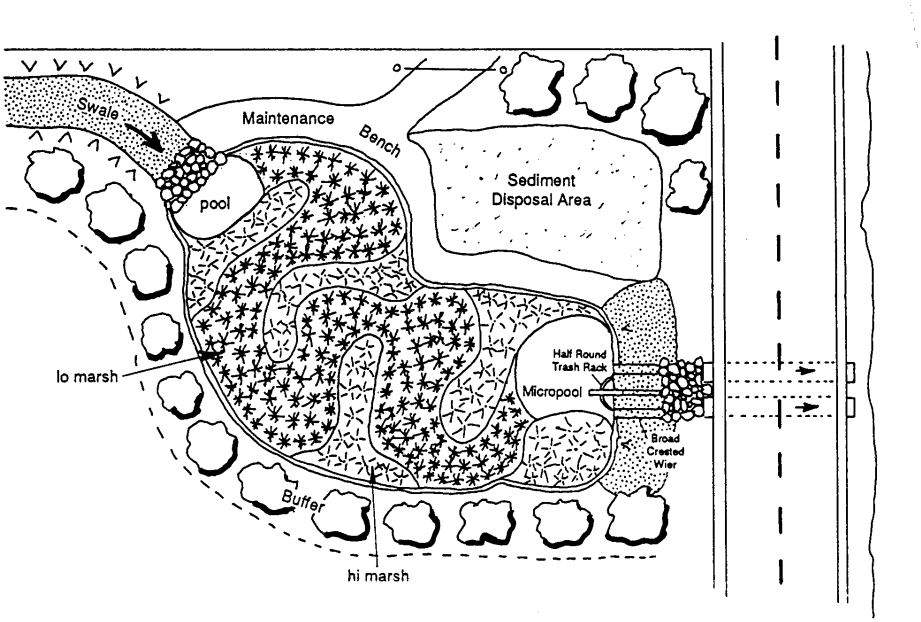
✧ Contact MDE's Water Quality Infrastructure Program for information about grant funding to local governments for the installation of stormwater management structures in existing developed areas.

Figure 2. Dry Extended Detention Pond



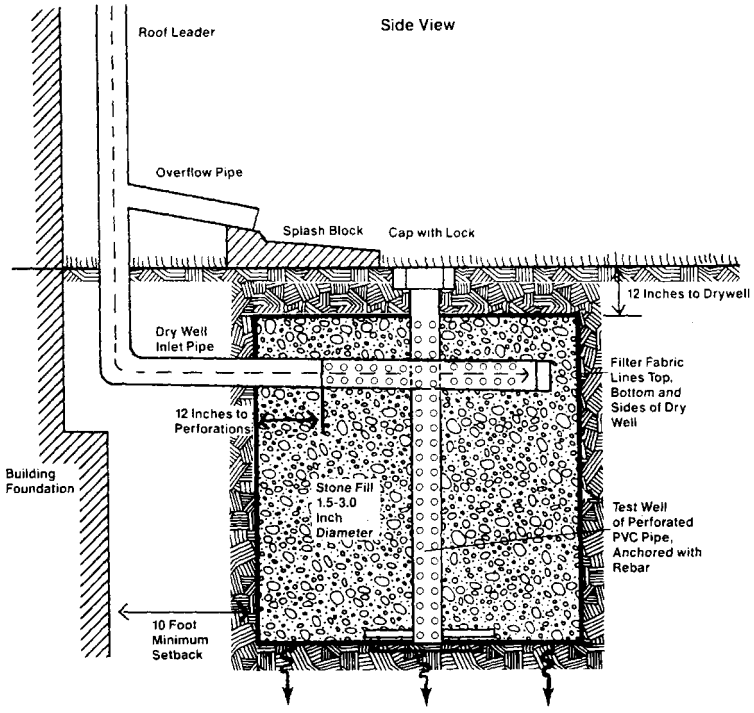
Source: Schueler, T.R. 1991. "Mitigating the Adverse Impacts of Urbanization on Streams: A Comprehensive Strategy for Local Governments," *Proceedings of the National Conference Integration of Stormwater and Local Nonpoint Source Issues.* Northern Illinois Planning Commission.

Figure 3. Pocket Wetland



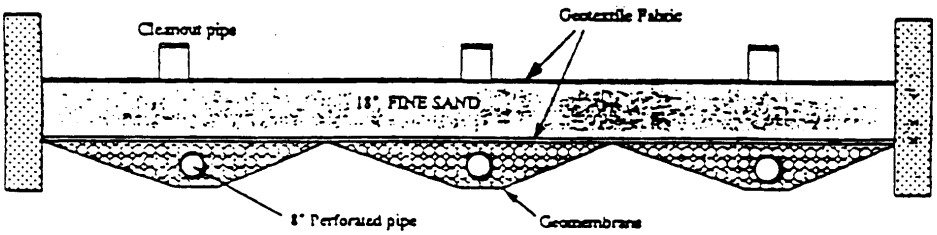
Source: Schueler, T.R. 1992. *Design of Stormwater Pond Systems.* Washington, DC: Metropolitan Washington Council of Governments.

Figure 4. Dry Well



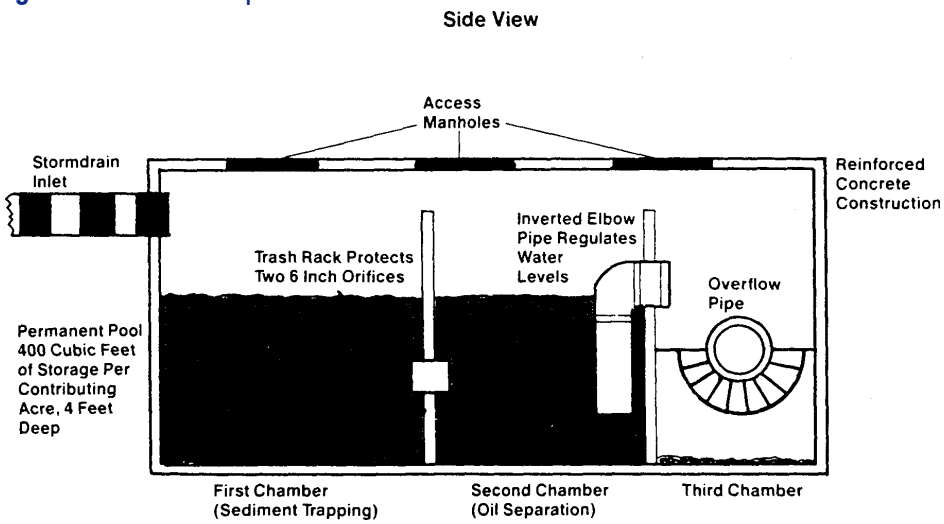
Source: Schueler, T.R. 1987. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban Best Management Practices.* Washington, DC: Metropolitan Washington Council of Governments.

Figure 5. Sand Filter



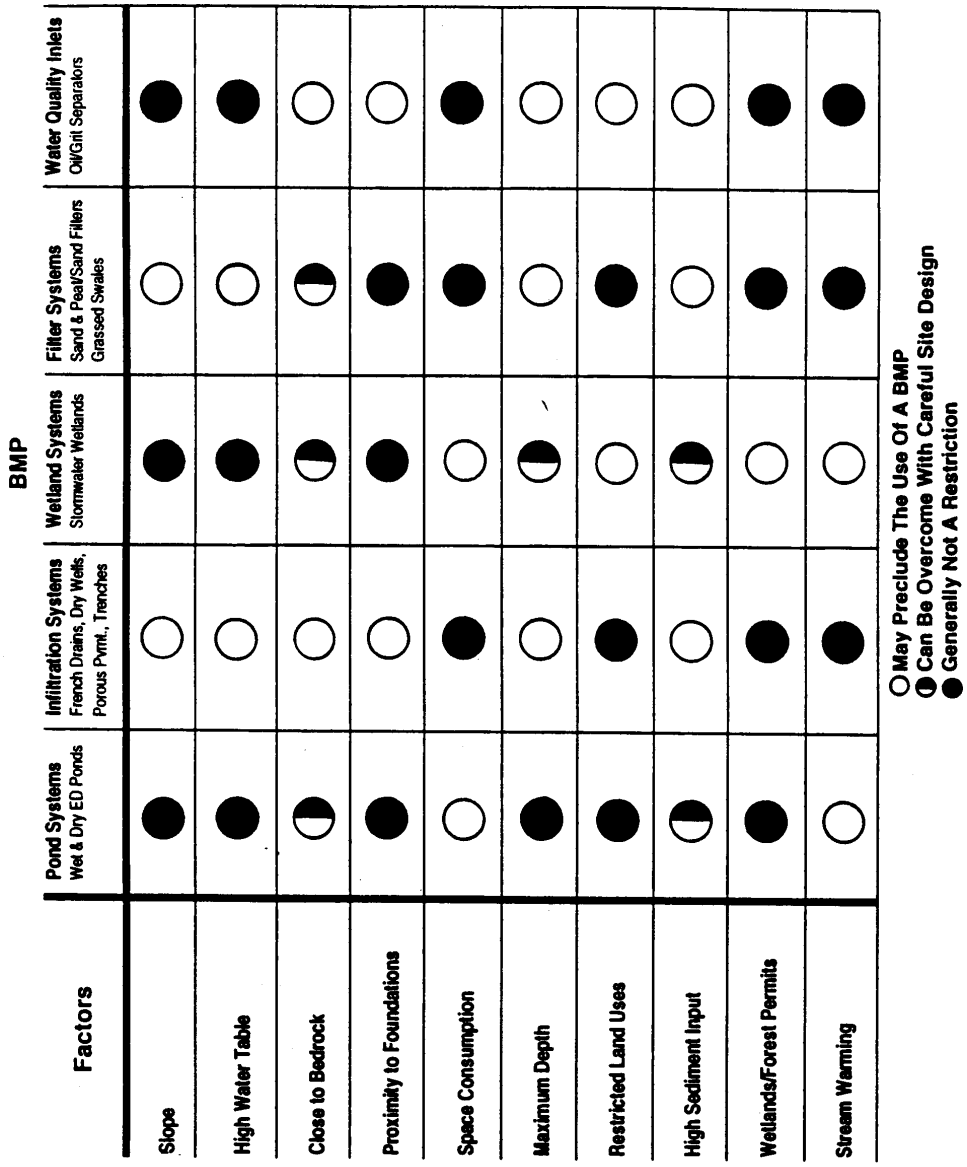
Source: City of Austin. 1991. *Design Guidelines for Water Quality Control Basins.* Austin, TX: Public Works Department.

Figure 6. Oil Grit Separator



Source: Schueler, T.R. 1987. *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban Best Management Practices.* Washington, DC: Metropolitan Washington Council of Governments.

Table 1. Screening Tools for Stormwater Management Best Management Practices Physical Feasibility



Source: Kumble, Peter, Lorraine Herson-Jones, and Thomas Schueler. 1993a. *Applicant's Guide for 10% Rule Compliance.* Annapolis, MD: Chesapeake Bay Critical Area Commission.

Information Sources

Appendix I

Chesapeake Bay Foundation

Chesapeake Bay Program Office

Maryland Department of the Environment
- Industrial Permits Division
- Water Management Administration
- Water Quality Infrastructure Program

Ocean Conservancy

Prince George's County

Appendix II

Local Critical Area Commission Contacts

Appendix III

BayScapes Program

Control Sediment from Construction Sites.

◆ Use devices such as hay bales, silt fences, storm drain filters, sediment traps, and earth dikes to prevent sediments from leaving construction areas.

Stencil Storm Drains.

❖ Stencil storm drains with the words "Don't Dump" and "Chesapeake Bay Drainage" (if appropriate). Stencils and instructions are available from the Chesapeake Bay Foundation and the Ocean Conservancy's Virginia Office. Be sure to get permission from the county or city department that maintains storm drains in your community. Generally, it is the Department of Public Works.